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Case report: bilateral occurrence of a chondroepitrochlearis muscle

The chondroepitrochlearis is an extremely rare muscular anomaly. Bergman et al. (1988) in their book on anatomical variations refer to 'costoepitrochlearis, chondroepitrochlearis, or chondrohumeralis' and describe the anomaly as a muscular slip which arises from one or more ribs, crosses the axilla, and inserts into the median intermuscular septum or medial humeral epicondyle. The phylogenetic significance of the muscle has received attention (Landry, 1958; Chiba et al. 1983; Bergman, 1991), and case reports with ulnar nerve entrapment and restriction of arm movements (FitzGerald, 1935–1936; Voto & Weiner 1987; Lin, 1988; Spinner et al. 1991) have emphasised its clinical relevance.

The authors of the present report encountered a bilateral example of the chondroepitrochlearis muscle in an 87-y-old Irish female. The observations were made during the course of routine prosection of the anterior thoracic wall and upper limbs of an embalmed cadaver (Fig). Upon cleaning the pectoralis major on the right side, a muscle slip closely applied to its inferolateral margin was found extending to the medial aspect of the arm. The muscle had an origin from the right fifth costal cartilage, near the costochondral junction, which was closely associated with, but distinct from, the inferolateral border of the sternocostal head of pectoralis major. After achieving its widest diameter of 1.7 cm, the muscle narrowed to a width of 0.6 cm before separating from pectoralis major to pass over the second and third digitations of serratus anterior. It received a 0.8-cm-wide neurovascular stalk from the axilla which was 16 cm from its chondral origin. The stalk was invested in axillary fascia and fat, and was visible for a distance of 4.2 cm before passing deep to the conjoined heads of pectoralis major. The superior border of the muscle was thus approximately 4 cm inferior to the anterior axillary fold. The muscle was tethered to the axillary fascia so that it pursued an arched course under the axilla. Fine nerve twigs entering the muscle from its superior aspect were traced back to their origin from the medial pectoral nerve. The muscle belly blended with the medial intermuscular septum of the deep brachial fascia and descended almost vertically along the medial aspect of the arm. Its musculotendinous junction was situated 10.5 cm above its insertion on the posterosuperior border of the medial epicondyle of the humerus. The slender tendon was related posteriorly to the ulnar nerve. On the left side, the chondroepitrochlearis muscle was identical in its origin, course and insertion, although there was marginally greater development of the muscle belly and tendon on the right. The total length of the muscle on both sides was approximately 35 cm. It was noted that the usual twist of the tendinous insertion of pectoralis major was absent on both sides. The clavicular head inserted in the normal manner, but the cranial portion of the sternocostal head inserted on the lateral lip of the intertubercular groove of the humerus proximal, instead of distal, to its caudal portion. There was no evidence of other accessory or anomalous muscles in this cadaver. Specifically,

no axillary arch muscle was demonstrated on either the right or left side.

Wood (1868) credited Duvernoy (1855) with the naming of the chondroepitrochlearis. Le Double (1897) is cited by Bergman et al. (1988) and Anson (1966) as finding the muscle in 12 to 20% of bodies. Such a high prevalence seems unlikely, given that so few cases have been documented. As in a recent report on the sternalis muscle (O'Neill & Folan-Curran, 1998) this is the first instance of the chondroepitrochlearis we have encountered in a shared dissection room experience of over 200 cadavers over a 20 y period.

Landry (1958) refuted the suggestion that Wood (1868) observed a true example of the muscle, claiming that what were described as 'epigastric slips' actually represented detached slips from the inferior border of pectoralis major that insert on the humerus on the deep surface of its own tendon of insertion. Spinner et al. (1991) suggested that the proportion attributed to Le Double (1897) may have been inflated by the inclusion in the calculations of other supernumerary muscles such as coracobrachialis longus and epigastric slips of pectoralis major.

The course of the muscle described in the present report parallels exactly that described by Perrin (1871). The same author also identified a compound variety of the muscle which terminated opposite the middle of the anterior aspect of the arm in a strong tendon, which had descended from the capsule of the shoulder joint anterior to the tendon of the long head of biceps brachii. An elongated slender tendon, such as that described in the present example, was common to all published cases, except that of Bryce (1899) in which the muscle remained fleshy to its insertion in the medial intermuscular septum, 2 inches above the medial epicondyle. Macalister (1871), in his treatise on human muscular variations, makes fleeting reference to a digastric chondroepitrochlearis.

Few authors have discussed the innervation of the chondroepitrochlearis muscle. Bryce (1899) traced the nerve supply to an anterior division of the brachial plexus. Landry (1958) attributed this pattern of innervation to its embryological origin from the ventral (flexor) muscle mass. Chiba et al. (1983) determined its nerve supply to be from the caudal pectoral nerve, the most caudal branch of the ansa pectoralis. A dual innervation was identified by Spinner et al. (1991) during the surgical excision of a chondroepitrochlearis muscle: one from the Y-junction of the medial and lateral roots of the median nerve, and the other from a branch of the medial pectoral nerve. The latter source of innervation was confirmed in the present case.

Chondroepitrochlearis may be considered an adductor of the arm at the shoulder joint (Lin, 1988; Spinner et al. 1991). In the patient described by Spinner et al. (1991), the muscular band was observed to contract on forcible adduction and flexion of the arm. Given the dimensions of the present muscle and its high tendon: muscle belly ratio

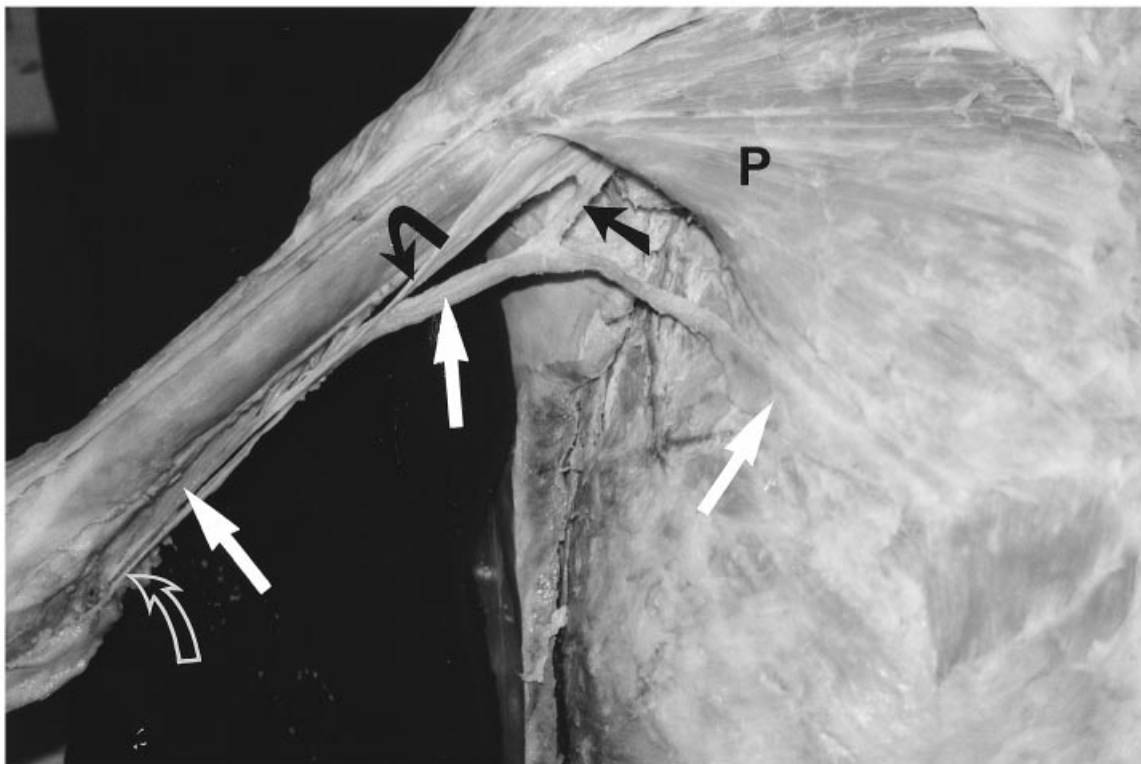


Fig. The chondroepitrochlearis muscle (solid white arrows) on the right side stretches from an origin at the lower border of pectoralis major (P) and extends distally to blend with the medial intermuscular septum of the deep brachial fascia (curved black arrow). The neurovascular stalk (straight black arrow) tethers the muscle as it arches under the axilla. Note the proximity of the ulnar nerve (open white arrow) as the slender chondroepitrochlearis tendon approaches the medial epicondyle.

(3:7), it must surely have been only a weak adductor of the arm.

To the best of our knowledge the case reported herein represents the only example of a bilateral chondroepitrochlearis muscle associated with the bilateral absence of the axillary arch muscle. The axillary arch muscle arises from latissimus dorsi and arches across the axilla to reach the undersurface of the tendon of pectoralis major, the tendon of coracobrachialis, or the deep brachial fascia covering biceps brachii. The present example differs from the case of Böse (1904) in that the bilateral example in that case was accompanied by a bilateral axillary arch muscle. In contrast, Tischendorf (1949) presented a bilateral example in which one side had a chondroepitrochlearis associated with an axillary arch muscle and the other side was an isolated chondroepitrochlearis muscle. The most recent example of a bilateral chondroepitrochlearis muscle was reported by Lin (1988). This case was in a patient who presented clinically with bilateral contracture of the chondroepitrochlearis and axillary arch muscles which differed from the present case in that the humeral insertion of the chondroepitrochlearis was just dorsal to the distal portion of the insertion of pectoralis major. Chiba et al. (1983) suggested that the chondroepitrochlearis is almost always associated with the axillary arch muscle, which itself occurs in 7 to 13% of the population. It is of interest to note that the 3 adult cases which presented clinically (Chiba et al. 1983; Lin, 1988; Spinner et al. 1991) all had an axillary arch muscle associated with the chondroepitrochlearis. In contrast, Voto & Weiner (1987) presented a case of cosmetic surgery on a 6-mo-old infant

with a contracture of the chondroepitrochlearis in whom an axillary arch muscle was absent.

The present case confirms previous studies (Landry, 1958; Bergman, 1991) which reported that the presence of an anomalous chondroepitrochlearis muscle is invariably associated with the absence of the usual twist of the tendon of insertion of pectoralis major. The tendon of pectoralis major is normally bilaminar. Costal fibres join the posterior lamina without twisting; fibres from the sternum and external abdominal oblique aponeurosis curve around the lower border, so that the fibres that are lowest at their medial origin are highest at their insertion on the humerus (Ashley, 1952). The significance of this observation derives from the fact that in mammals, the insertion of pectoralis major may extend from the greater tuberosity of the humerus to the medial epicondyle.

Landry (1958) concluded that chondroepitrochlearis is an atavistic anomaly which demonstrates the distal extent of the insertion in ancestral forms. The chondroepitrochlearis muscle has been found at autopsy in infants with chromosomal defects, namely, trisomy 13 with a D/D translocation (Aziz, 1980) and trisomy 18 (Bersu & Ramirez-Castro, 1977). Barash et al. (1970) postulated that the genetic code for such atavistic muscles is normally repressed during embryogenesis and that trisomy 18 causes derepression of these genetic loci.

In summary, this case delineates a bilateral example of the rare supernumerary muscle, the chondroepitrochlearis. It is associated with absence of an axillary arch muscle and of the normally twisted insertion of pectoralis major. The anomaly

has attracted clinical attention because of its potential to cause cosmetic defects, to restrict abduction of the arm, and to entrap the ulnar nerve. Thus it may be of particular interest to plastic surgeons, orthopaedic surgeons, and neurologists.

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